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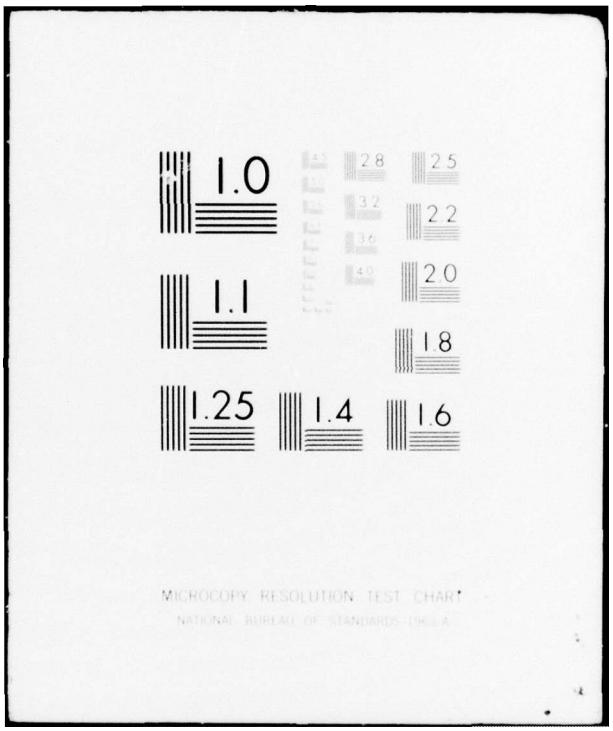
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CERENKOV RADIATION IN THE ATMOSPHERE

J. V. Jelley and T. Cranshaw, acting on a suggestion of P.M.S. Blackett that fast cosmic ray particles should produce Cerenkov radiation in the atmosphere, have demonstrated a correlation in time between large light pulses and cosmic rays. The experiment was carried out at night on Harwell airfield. An EMI 6260 photomultiplier was placed at the focus of a 10" parabolic mirror mounted in a vertical tube a few feet long. When the upper end of the tube was uncovered, the photomultiplier output increased from a normal dark current pulse distribution to an intense, slowly fluctuating, pulse distribution resulting from light from the twelve degrees of sky observed by the apparatus. An oscilliscope was triggered by photomultiplier pulses whose size exceeded three times the night sky noise, and the pulses were displayed on the scope after a suitable delay. A counting rate of approximately one large pulse per minute was obtained at this arbitrary bias setting and pulses of this size were found to be completely absent when the tube was shielded against light from the night sky. The identification of the pulses as associated with cosmic radiation was made by use of Geiger counters. A coincidence circuit permitted examination of the time relation between light pulses from the photomultiplier and pulses from one or more of sixteen Geiger counters arranged in a square array having a spacing of sixty meters between neighboring counters. During one typical hour of operation on a clear night fifty large light pulses were recorded. Of these eighteen occurred simultaneously with the discharge of one Geiger counter. Two corresponded to a discharge of two counters, and one pulse was simultaneous with a three counter discharge. In this experiment the random coincidence rate is completely negligible so that about forty per cent of the light flashes occurred in true coincidence with the discharge of a Geiger counter.

It is tentatively believed that the light pulses are Cerenkov radiation produced in the atmosphere by relativistic particles in extensive air showers. Further experiments are in progress and Jelley and Cranshaw have proposed to study the polarization of the light to identify it with Cerenkov radiation. It is also planned to measure the total intensity of the light.

NUCLEAR AND SOLID STATE PHYSICS RESEARCH AT THE LABORATORY FOR TECHNICAL PHYSICS, MUNICH

Since Professor H. Maier-Leibnitz assumed his duties as director of the Laboratory for Technical Physics, Technische Hochschule, Munich, the program of the laboratory is rapidly taking on a "nuclear" appearance. The Laboratory was previously directed by Professor W. Meissner and its program included turbulence measurements, thermal conductivity measurements in salt solutions, acoustics, and research on single crystals of metals. Some remnants of this research are still being carried out, but they will be abandoned as soon as the students get their degrees. Since the war the low temperature part of the laboratory has been located at Herrsching, some 40 km southwest of Munich; it is now completely divorced from the Technische Hochschule and is sponsored by the Bavarian Academy of Sciences.

Maier-Leibnitz hopes to build a 3-million volt proton accelerator during the next two years. This machine will also serve as a source of neutrons through the Li(p,n) reaction. The design of the machine has not been fixed, but it will probably not be a cyclotron or an electrostatic generator. Complete electrostatic focusing will be used, if possible, since it is cheaper than magnetic focusing. Space for the accelerator is available, and Maier-Leibnitz thinks that funds can be obtained from the Bavarian State Government.

Momentum Distribution of Electrons in Metals

At the present time Maier-Leibnitz is continuing his program of applying nuclear techniques to the study of electronic properties of solids. He previously obtained the average momentum of electrons in various metals by measuring the annihilation radiation of slow positrons in the solid metal (Z.f. Naturforschung 6a, 663 (1951)). In this experiment the positrons were produced in Na^{22} which was covered by plates of the metal to be studied; the two counters which were used to record the annihilation γ rays

were placed on opposite sides of the source (at 180° to each other) and were irradiated axially. Each counter presented a six-degree aperture to the source; nevertheless, small angular deviations of a few tenths of a degree (from 180°) for the 2-quanta annihilation radiation could be measured by the reduction in coincidences due to the fact that the average γ ray strikes the counting surface at an angle, and the larger the angle the smaller is the probability of the quantum being counted. The deviation from 180° for the two quanta is of course due to the mementum of the center of mass of the electron-positron system at the moment of annihilation, and it is the average of this quantity which is to be measured in an experiment of this type. Actually Maier-Leibnitz's earlier experiments measured the average value of p^2 where p is the momentum of the electron-positron system.

Maier-Leibnitz is now engaged in measuring the momentum distribution of electrons in the metal. In order to accomplish this he uses a bank of counters on both sides, each counter presenting a small angular aperture to the beam; the electrical circuits are wired so that coincidences between a given counter and each of the counters on the other side can be recorded. The small angular apertures are obtained by tilting the counters through an angle of 75° to 80°; thus they are no longer irradiated axially.

Maier-Leibnitz's earlier experiments do not agree with the hypothesis that only the valence electrons are effective in annihilating positrons. In fact they seem to indicate that either the effect of the inner shells is considerable, or that our present ideas about electrons in a metal are in error. It is hoped that the new series of experiments will clarify the picture, possibly by showing two groups of electrons with different momenta.

SYMPOSIUM ON AUTOMATIC COMPUTING IN ATOMIC THEORY

A Symposium on Numerical Analysis and Automatic Computing in Atomic Theory was held on 9 December at the Mathematical Laboratory of Cambridge University. Dr. M.V. Wilkes, Director of the Laboratory, presided. The audience comprised 50 to 100, including physicists, chemists, engineers, and mathematicians.

Professor D.R. Hartree of Cambridge University outlined the mathematical nature of the problem of atomic theory - the solution of Schrödinger's equation for numerous degrees of freedom and with a variety of boundary conditions - and showed that "exact" solutions were far beyond the reach of any automatic computer yet envisioned. He then reviewed several useful methods of approximate solution (including the variation method and his own "self-consistent field"), sketched the sort of numerical analysis used before the advent of large machines, and touched on the relatively new machine methods.

A.S. Douglas of Cambridge described two studies for which a computing machine of large size and great speed was essential. The first of these studies was the task of inferring an average polarization correction to the self-consistent field, by comparison of measured and previously computed energy level values. Since trial-and-error was used, only the speed of the machine made the task worthwhile; otherwise the problem posed no particular complexity. The second study was a far more ambitious attempt to solve exactly the two-electron problem (the helium atom, for example) by an iteration method previously used in one-electron cases. The method was successfully tested at Cambridge on the linear oscillator and the hydrogen atom. The storage requirements for the helium atom calculation exceeded the range of Cambridge University's EDSAC. Accordingly some trials had been made on the larger University of Manchester computer, but it was not yet clear that the latter was fast enough, flexible enough in output-input methods, or sufficiently reliable in long-term storage.

R.A. Buckingham of London University discussed the scattering of slow electrons by light atoms. He described the usual approximations of scattering theory, and emphasized one or two which seemed most susceptible to automatic computing methods. In these cases, however, the most likely procedures had not yet been determined.

V.E. Price of Cambridge described some results of the Boys approach. This procedure has already led to numerical results for over 20 atomic and ionic structures, most of which have not yet been published. No attempt is made to represent wave functions in the formulations peculiar to analytic solution, nor yet in those most suitable for conventional numerical calculus. Instead full use is made of the digital computer's ability to handle large numbers of iterative calculations based on easily integrated functions.

ANATOMY AND PHYSIOLOGY OF BONE MARROW

Professor J.M. Yoffey, head of the Department of Anatomy at the University of Bristol, has a program of current research centered largely on the anatomy and physiology of bone marrow. The work is being done on the guinea pig, chosen for its amiability as a research animal and the suitability of its femor bone marrow for processing. The animal, after being stressed in various ways, e.g., by exposure to high altitude, is killed and rapidly exsanguinated; the femor is removed, the marrow extruded into normal saline by air pressure applied at one end of the cut ends, and the volume of the marrow quite accurately measured. By differential staining procedures the population of various types of cells are determined by standard counting procedures. These researches, which are being assisted by Dr. Gall, are directed at determining the stimuli and mechanism of blood-cell production.

Professor Yoffey has made a particularly good color movie of the lymphatic system. This film will be shown at the meetings of the Association of American Anatomists in March 1953, and should be of considerable interest to physiologists as well as anatomists.

Dr. Metcalf, of the Department of Anatomy, is engaged in constructing an absorption spectrophotometer microscope based on Dr. Burch's reflecting microscope. This device is still in the development stage.

TECHNICAL REPORTS OF ONRL

The following reports have been forwarded to ONR, Washington, since the last issue of ESN. Copies may be obtained from the Technical Publications Office, Code 250, Office of Naval Research, Washington 25, D.C.

ONRL-142-52 "Low Temperature Physics Research at Cambridge", by J.R. Reitz

PERSONAL NEWS ITEMS

The British Institute of Metals has awarded its Platinum Medal for 1953 to Professor G. Masing of the Institut für Allgemeine Metallkunde at Göttingen in recognition of his outstanding contributions in the field of metallography.

The Institute's Rosenhain Medal for 1953 has been awarded to Dr. C. E. Ransley of the British Aluminum Company Research Laboratories in recognition of his outstanding experimental and theoretical work on gas-metal equilibrium.

Professor H. Maier-Leibnitz was recently appointed director of the Laboratory for Technical Physics, Technische Hochschule, Munich, to succeed Professor W. Meissner, who has retired. Previously Maier-Leibnitz was associated with the Institute for Physics in the Max-Planck-Institute for Medical Research at Heidelberg, where he was an "ausserplanmässig" professor (i.e., without a chair). In accordance with German university tradition, the program of the Laboratory for Technical Physics will change in order to accommodate the new Professor's interests (see article on Physics Research at the Laboratory for Technical Physics, Munich, in this issue).

NEW YEAR'S HONORS LIST

The following is a partial list of scientists whose names appeared in the New Year's Honors List:

Knights Bachelor:	Mr. H.R. Cox, Chief Scientist, Ministry of Fuel and Power
	Dr. A.W.M. Ellis, Emeritus Professor of Medicine, University of Oxford
	Prof. H. Jeffreys, Plumian Professor of Astronomy and Experimental Philosophy, University of Cambridge
Commander of the Bath:	Mr. J. Buckingham, Director of Research for Programs and Planning, Royal Naval Scientific Service, Admiralty
	Dr. R. Spence, Chief Chemist, Atomic Energy Research Establishment, Harwell
Commander of the British Empire:	Mr. W. Cawood, Dep. Dir., Royal Aircraft Est., Ministry of Supply

Commander of the British Empire (cont'd):

Mr. D.N. McArthur, Director, Macaulay Inst. for Soil Research, Aberdeen

Prof. R.A. McCance, Director, Dept. of Experimental Medicine, Med. Res. Council, and University of Cambridge

Mr. C.J. Turner, Chief Engineer, Div. of Atomic Energy (Production), Risley, Ministry of Supply

Mr. L.C. Tyte, Dep. Chief Scientific Officer, Fort Halstead, Ministry of Supply

FORTHCOMING EVENTS

JOINT MEETING OF FRENCH AND GERMAN METALLURGICAL SOCIETIES

In March 1953 a meeting will be held at the Institut de Recherches Metallurgiques at Sarrebruck under the joint sponsorship of the Societé Francaise de Métallurgie, Verein Deutscher Eisenhüttenleute, and Deutsche Gesellschaft für Metallkunde. The two subjects of the meeting will be: the application of ultrasonics and methods of interpreting ultrasonic examination of metals; the tension test and its applications.

INTERNATIONAL MEETING ON STEEL MAKING

On 7-9 May, 1953, an international meeting on steel making processes and operation will be held in Liege, Belgium, under the joint sponsorship of the Liège Section of the Centre National de Recherches Métallurgiques, the Societé Francaise de Métallurgie, the Verein Deutscher Eisenhüttenleute, and the Iron and Steel Institute. The first day of the meeting will be devoted to the new low shaft blast furnace development, and subsequent sessions will be concerned with recent advances in Bessemer converter operation.

Those who wish to attend the meeting are requested to communicate with Mr. A. Gillet, Secretary of C.N.R.M., 12 Quai Paul Van Hoegaerden, Liège, Belgium.

Prepared by the Scientific Staff
Submitted by Dr. S.R. Aspinall
Deputy-Scientific Director

Philip D. Lohmann

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